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IN-SITU REAL-TIME MONITORING TECHNIQUE AND APPARATUS FOR
ENDPOINT DETECTION OF THIN FILMS DURING CHEMICAL/MECHANICAL
POLISHING PLANARIZATION

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation of and claims priority to U.S. Application Serial
No. 07/996,817, filed on December 28, 1992, ^{NOW US 6,614,529} the entirety of which is incorporated by
reference.

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FIELD OF THE INVENTION

The present invention is directed to a technique and apparatus for the optical
monitoring and measurement of a surface undergoing rotation, particularly for in situ, real-
time monitoring of any thin film undergoing rotation and simultaneous dimensional changes.
It is particularly useful in the field of wafer planarization for producing wafers of extreme
flatness and uniformity that are desirable in the production of semiconductor and integrated
circuits.

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BACKGROUND OF THE INVENTION

As microelectronic device dimensions continue to shrink, patterning problems
increasingly hinder integrated circuit and semiconductor device fabrication. Semiconductor
device fabrication often requires extremely planar surfaces and thin films of precise
thicknesses. The surfaces requiring planarization and thickness control in semiconductor
devices include areas or layers of dielectric material (such as SiO₂) on the surface of
semiconducting materials and other device pattern layers. The insulating dielectric layers and
other device layers need to be extremely planar because irregularities and rough topography
lead to fabrication problems, including Depth of Focus budget (hereafter DOF) problems.
Since an irregularity in the surface can cause part of the surface to be out of focus at a
particular distance between the optical system and the wafer, errors in pattern formations can
occur. Also, the thickness of layers needs to be precisely controlled because variations in
thickness may affect the electrical properties of the layers and adjacent device patterns,
particularly in the interconnections between the different layers of microelectronic devices.

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